

14.7 Cracking ethanol

Ethanol can be broken down or 'cracked' by **dehydration**. Dehydration is the removal of water from a substance.

Aim

To crack ethanol with aluminium oxide, collect ethene, and investigate the reactions of ethanol and ethene.

Apparatus and material

Hard glass test-tube, 125 × 16 mm

Four test-tubes with stoppers

Test-tube rack

Delivery tube fitted with Bunsen valve

Bunsen burner and mat

Ceramic wool

Stand, boss and clamp

Trough

Splints

Dropping pipette

Universal Indicator paper

Ethanol

Aluminium oxide

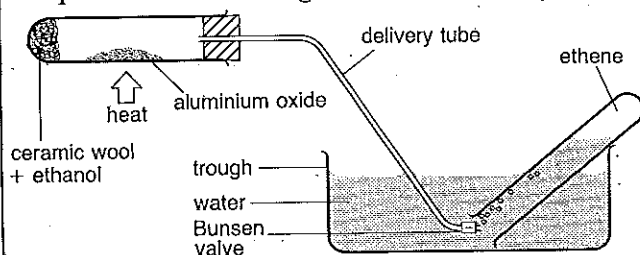
Bromine water

Potassium manganate(VII) solution,
0.01 mol dm⁻³

Sulphuric acid, 2 mol dm⁻³

Procedure

- 1 Place a tuft of ceramic wool in the hard glass test-tube. Pack the tuft down to a depth of about 2 cm.
- 2 Using a dropping pipette drop ethanol onto the ceramic wool until it is saturated. Pour off any excess ethanol.
- 3 Turn the test-tube on its side. Place five spatula measures of aluminium oxide inside the test-tube. Push the aluminium oxide together to form a pile.
- 4 Clamp the hard glass test-tube horizontally. Insert the delivery tube attached to a Bunsen valve. Fill a test-tube with water and place it in the trough over the delivery tube.



- 5 Gently heat the aluminium oxide.
- 6 Occasionally move the Bunsen flame to heat the ceramic wool.
- 7 Allow the first few bubbles of gas to escape in the trough. Afterwards collect four test-tubes of gas.
- 8 Note the smell.
- 9 Attempt to light a sample with a splint.
- 10 Add a few drops of bromine water to a sample. Stopper the test-tube and shake the contents. Note any change in colour.
- 11 Prepare a solution of acidified potassium manganate(VII) by mixing equal volumes of sulphuric acid and potassium manganate(VII) solution. Add a few drops of this solution to a sample. Stopper the test-tube and shake the contents. Note any change in colour.
- 12 Add a piece of moist pH paper to the sample.
- 13 Repeat steps 8–12 with ethanol. In step 9 add a few drops of ethanol to a piece of ceramic wool before attempting to set the ethanol on fire (take care).

Results

Copy and complete the following table:

test	observation	
	ethene	ethanol
combustion		
bromine water		
acidified potassium manganate(VII) solution		
pH paper		

Questions

- 1 a) What happens to any ethanol vapour which passes into the trough of water?
- b) Why must the ceramic wool soaked in ethanol not be heated before heating the aluminium oxide?
- c) Compare the smell of ethanol with ethene.
- d) Why are the first few bubbles of gas not collected?
- e) What is the function of aluminium oxide in the experiment?